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(51) INT CL<sup>6</sup>

A63B 71/12, A41D 13/00

(52) UK CL (Edition Q)

A3V V60

(56) Documents Cited

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86-105511(16)

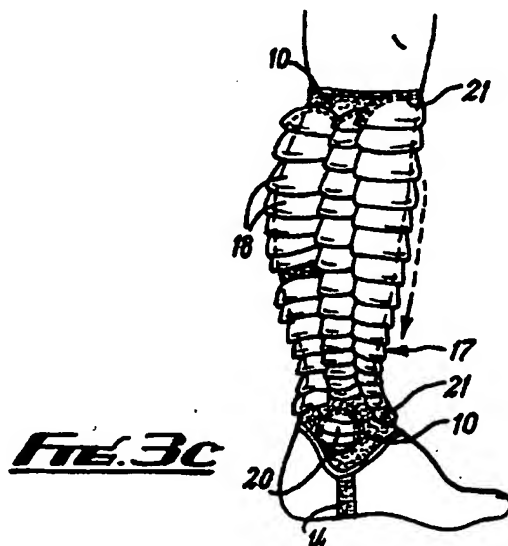
(58) Field of Search

UK CL (Edition P) A3V  
INT CL<sup>6</sup> A41D, A63B, F41H  
Online: WPI

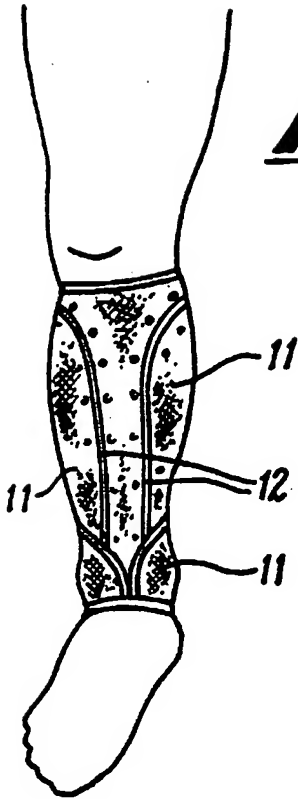
(54) Abstract Title

Protective sportswear

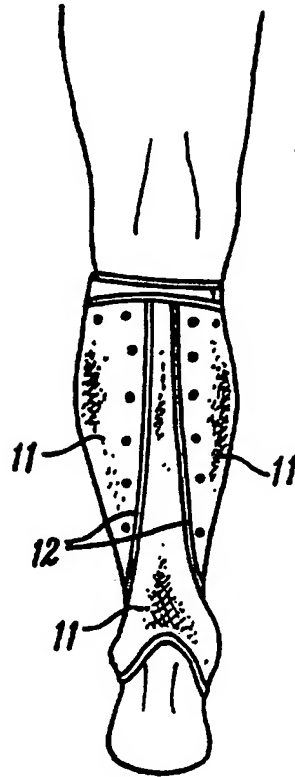
(57) An appliance for protection against impact and strain injury comprises an inner flexible web or sleeve (10) adapted to be worn about a part of the body such as the lower leg and to conform closely to the shape thereof, and a series of interconnected outer rigid plates (18) attached to the inner web or sleeve such as to provide impact absorption and distribution whilst permitting relative movement between the plates and maintaining its position in use without restraining the wearer's bodily movement. The device is particularly intended to prevent injuries to sports people. Instead of the web or sleeve (10) spaced straps may be used to attach the appliance to the wearer. A layer of absorbent foam may underlie the plates. The plates may be interconnected by elastic strips in rows.



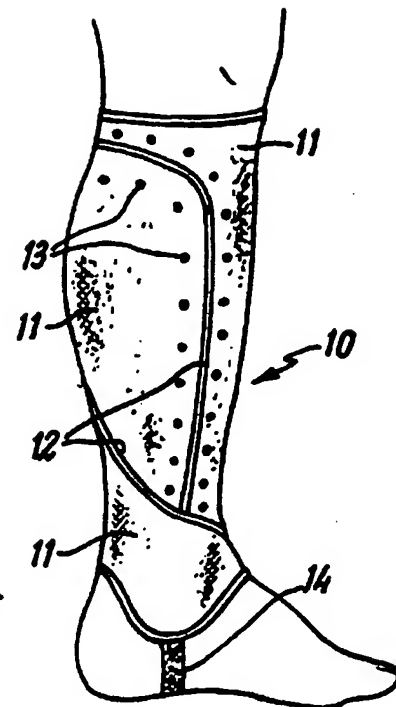
**FIG. 1a**



**FIG. 1b**



**FIG. 1c**



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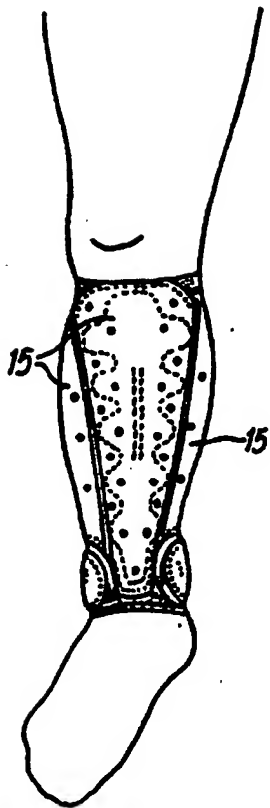


FIG. 2a

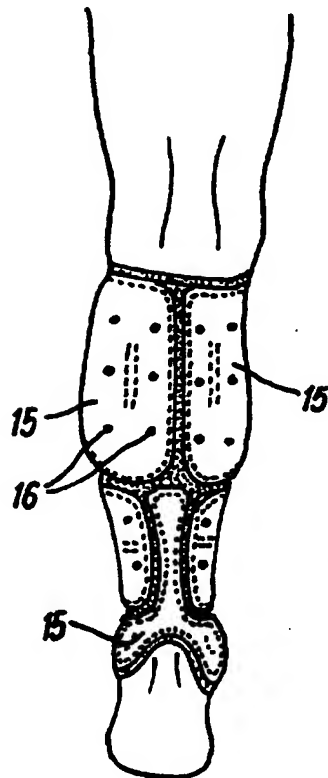


FIG. 2b

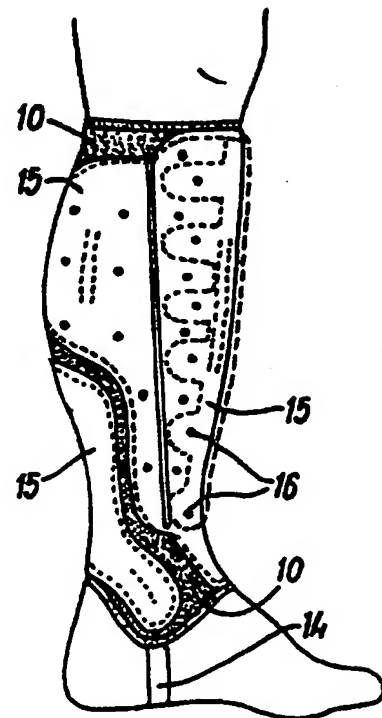


FIG. 2c

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FIG. 3a

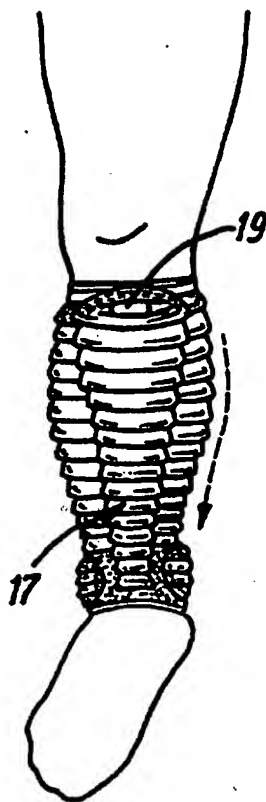


FIG. 3b

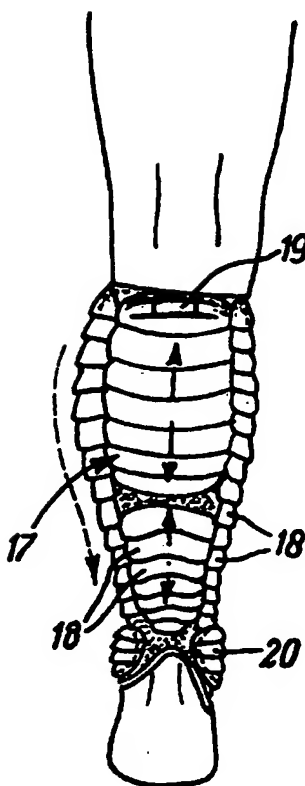
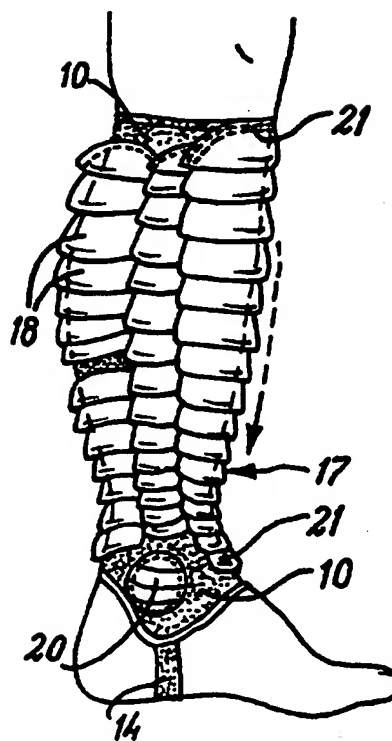
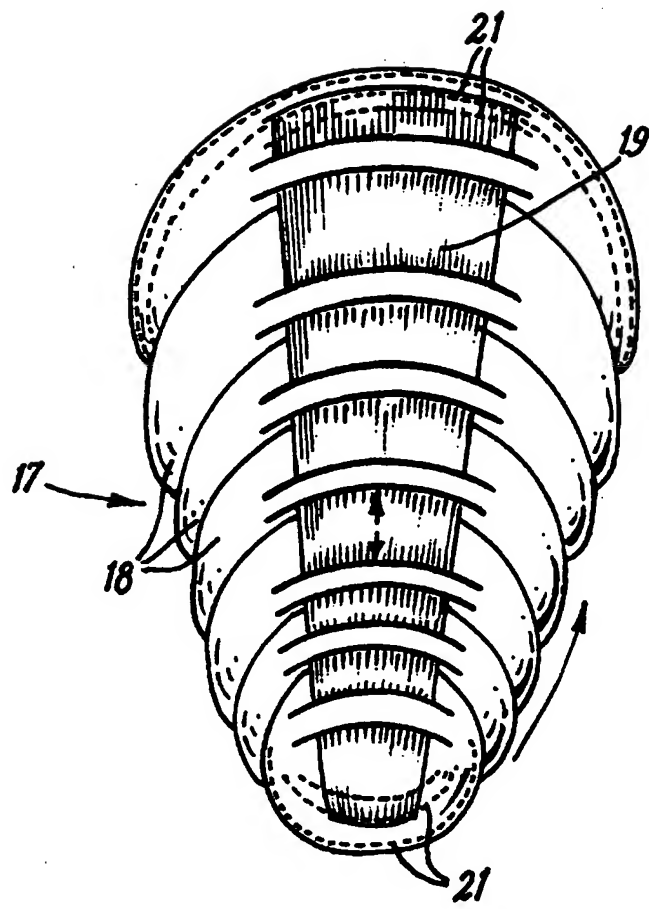


FIG. 3c

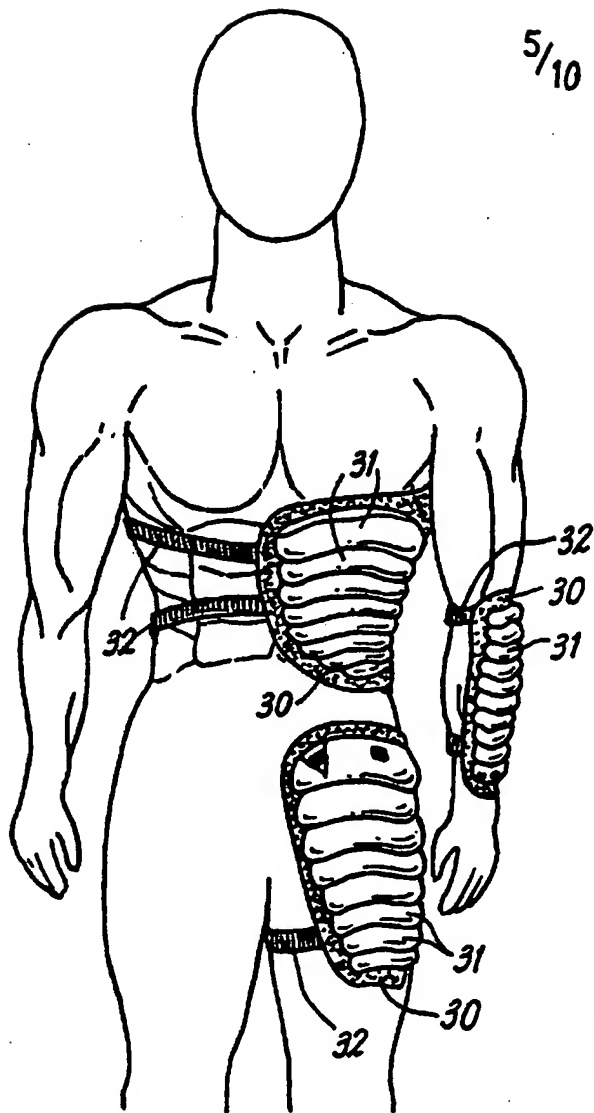


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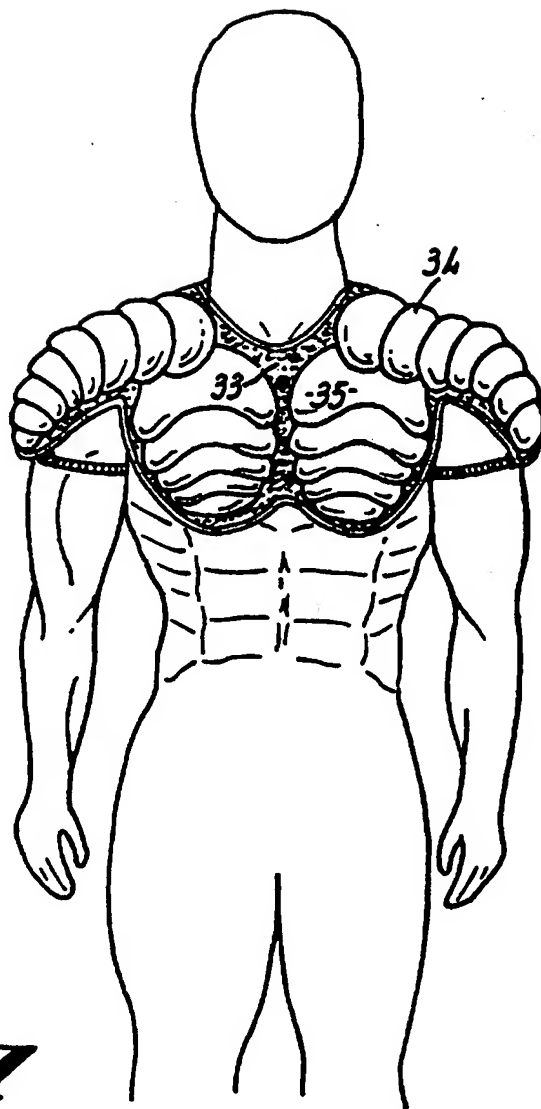


**FIG 4**

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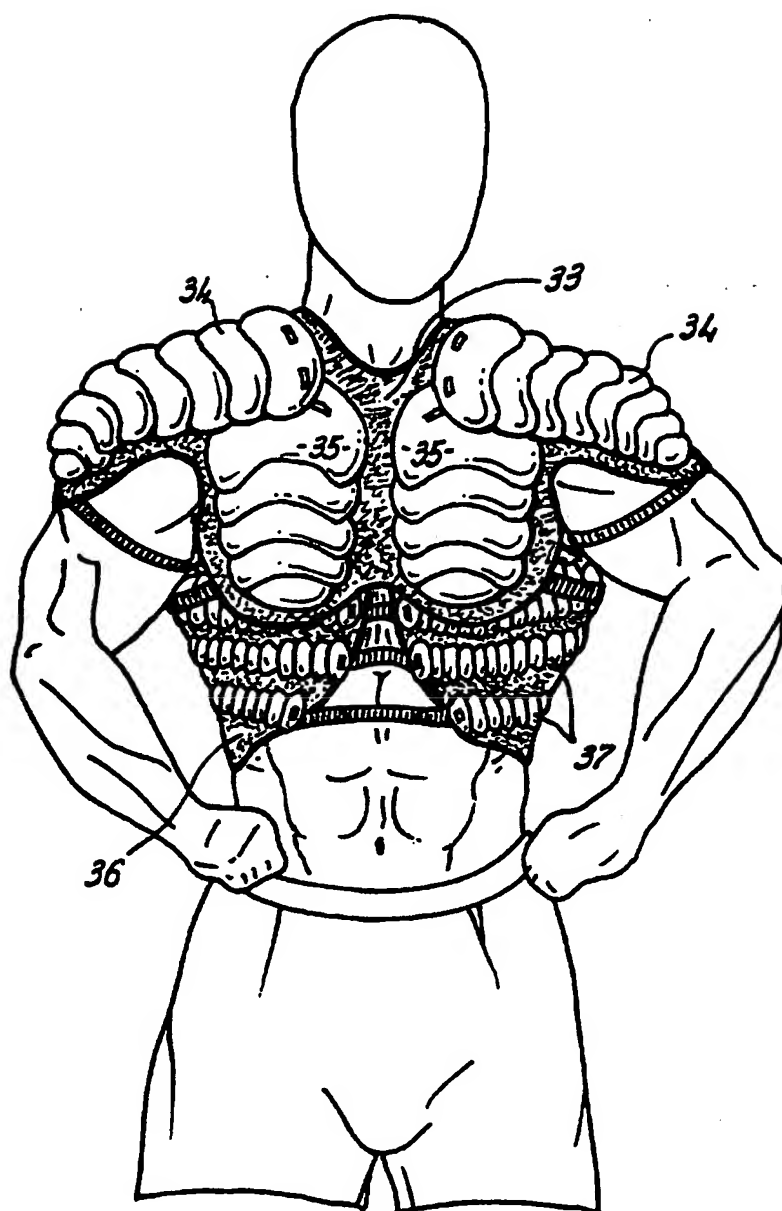


**FIG. 5**



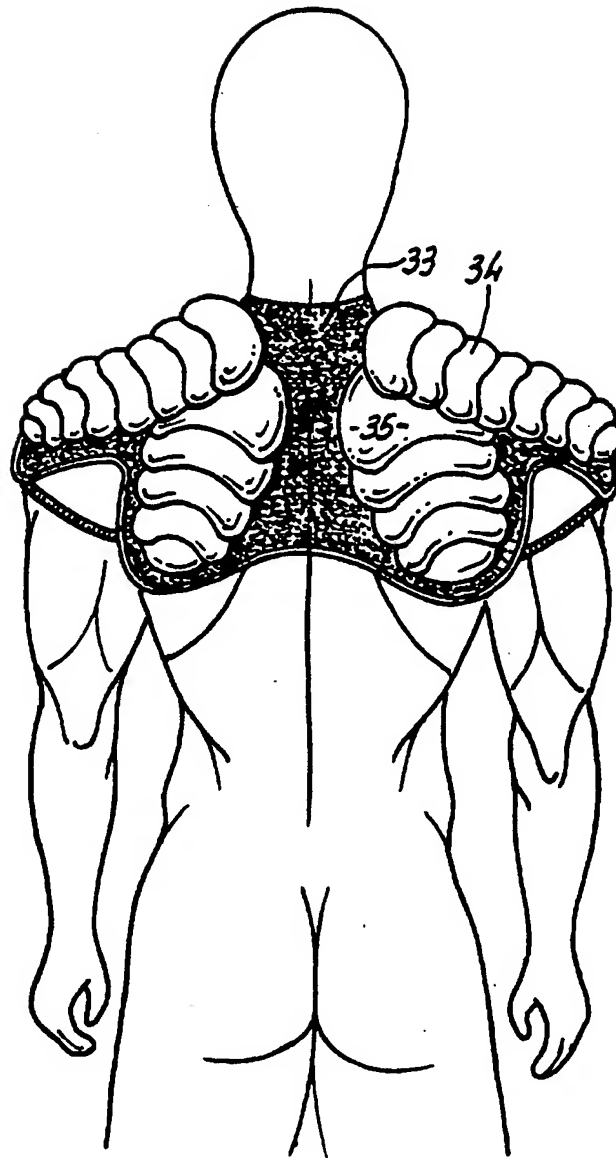
**FIG. 7**

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**FIG. 6**

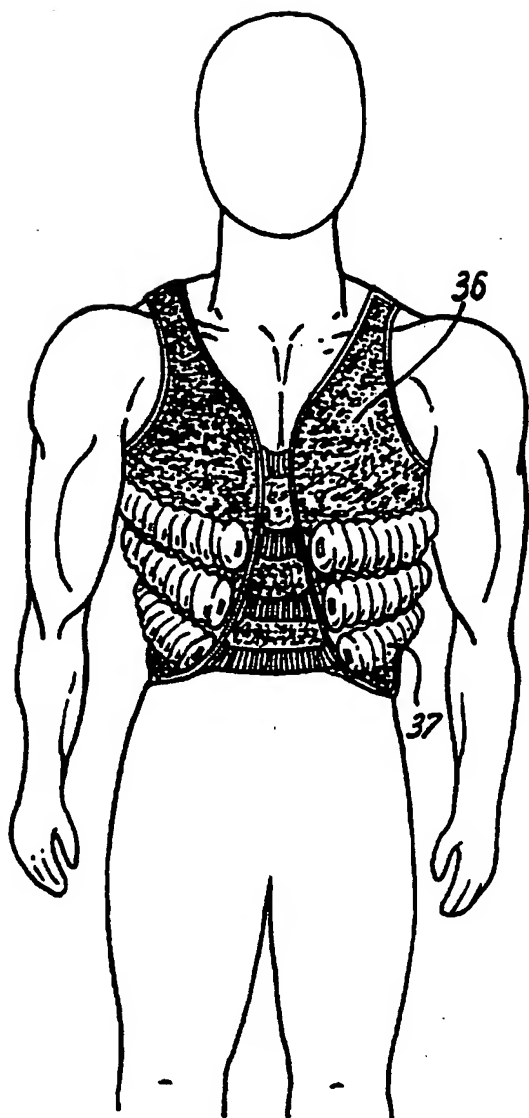
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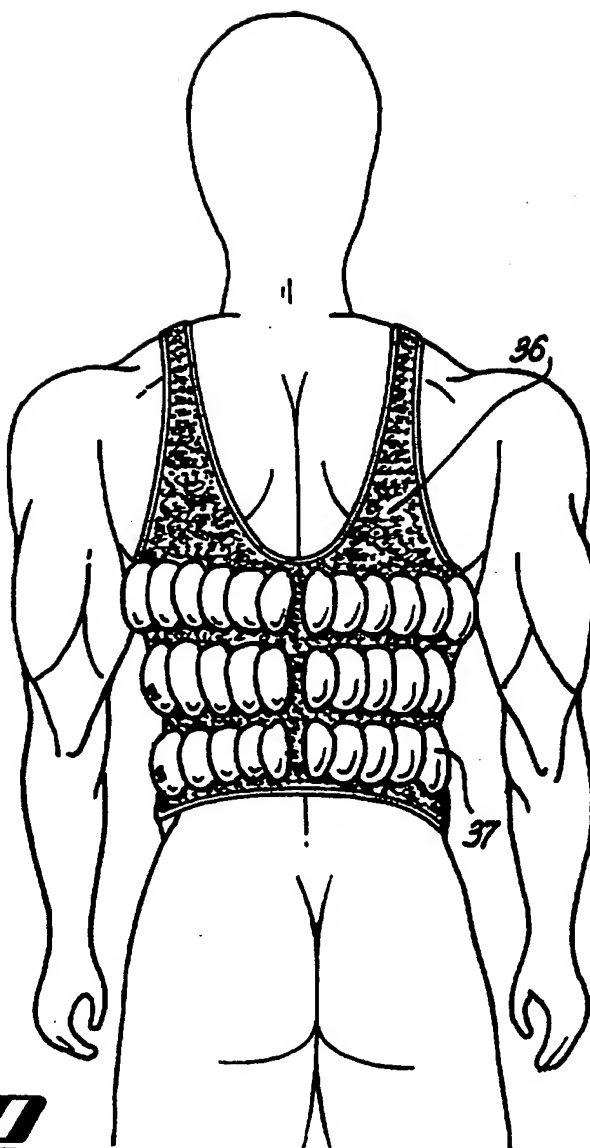
**FIG. 8**



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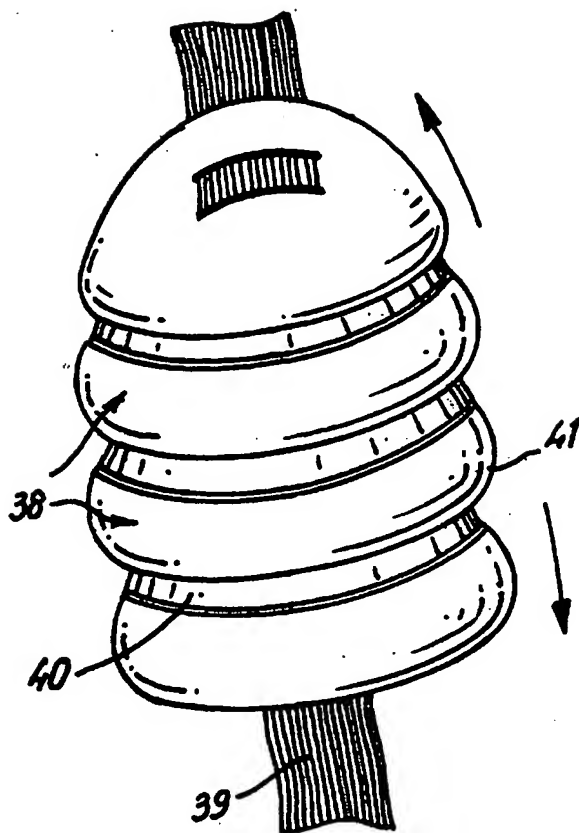


**FIG. 9**



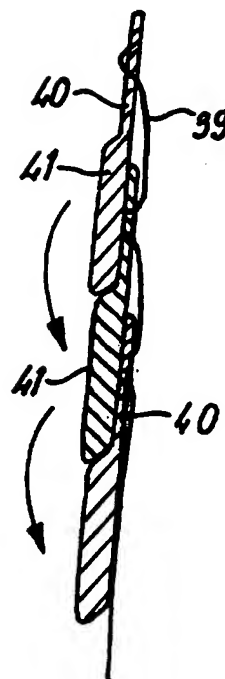
**FIG. 10**

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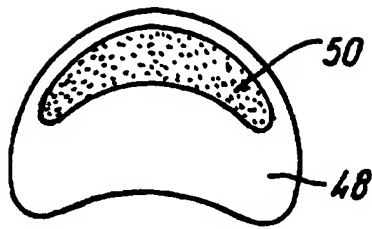


**FIG. 11**

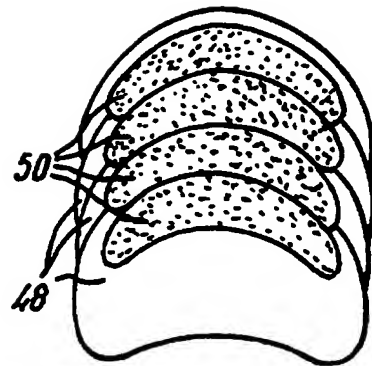
**FIG. 12**



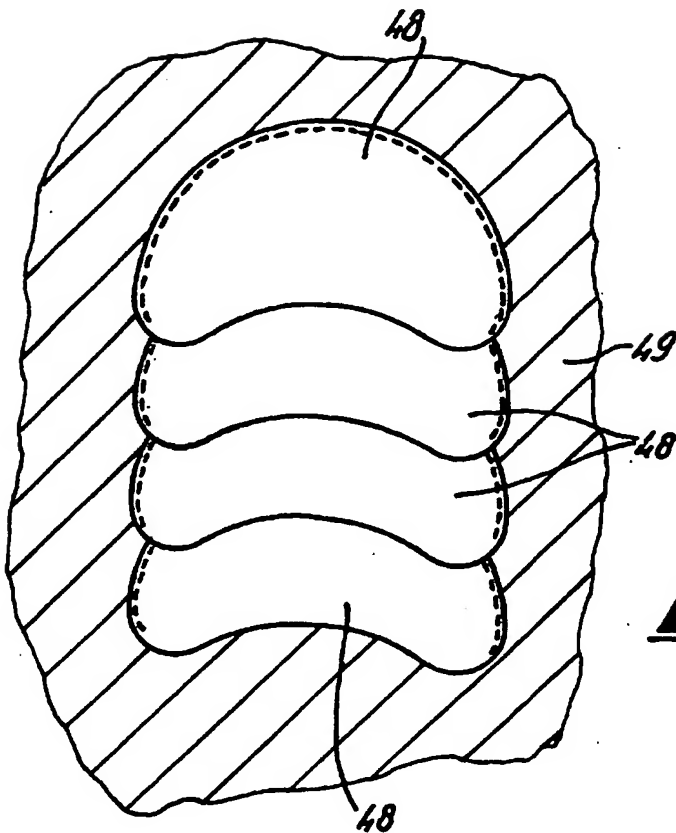
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**FIG. 13**



**FIG. 14**



**FIG. 15**

## A PROTECTIVE APPLIANCE

THIS INVENTION concerns an appliance for protection against impact and strain injury and is particularly intended to prevent such injuries to sports people.

In certain sports, such as football for example, players are particularly vulnerable to injury of the lower leg including bruised lower shins, swelling of the softer muscle tissue on the inner shin, bruised ankles, abrasions to the calves and rear of the leg and swelling or bruising to the Achilles tendon. Many of these injuries occur as a result of impact but also muscle and tendon strain.

Conventional injury prevention means in general include such as elasticated sleeves adapted to be applied over joints or sensitive areas of the body, and devices known as shin pads i.e. one-piece rigid shields which are worn, for example, beneath a football sock. Existing shin-pad designs, whilst effective to a degree, offer a limited level of protection against many of the aforesaid types of injury. One weakness of the standard shin pad is that as a result of a head-on or side-on impact, the pad tends to slip around the lower leg beneath the sock and thus does not provide sufficient impact resistance.

The present invention is concerned with providing a protective appliance which conforms closely to the shape of a body

part and which affords adequate impact resistance whilst maintaining its position in use. A further object of the present device is to ensure that the force of an impact is distributed throughout the appliance thus minimising localised bruising.

Commensurate with affording adequate protection, the wearer must retain complete freedom of movement so as not to impair physical performance and also to ensure that muscle injury due to unnatural movement or restraint, does not occur.

According to the present invention, an appliance for protection against impact and strain injury, includes a flexible web or sleeve adapted to be worn about a part of the body and to conform closely to the shape thereof, and a plurality of interconnected rigid plates attached to or adapted to be attached to the web or sleeve such as to permit limited relative movement between the plates.

The web or sleeve may be of continuous tubular form throughout its length, or alternatively, a plurality of longitudinally-spaced straps to be applied about the body to secure the rigid plates, or a panel being part of an item of sports clothing.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figs. 1a to 1c illustrate respectively in front, rear and

side views an inner part of an appliance made in accordance with the invention and worn on the lower leg;

Figs. 2a to 2c similarly illustrate an additional feature of the inner part illustrated in Figs. 1a to 1c;

Figs. 3a to 3c similarly illustrate, as an outer view, the entire appliance when similarly worn;

Fig. 4 is an internal view of an outer part of the appliance;

Fig. 5 illustrates in front views an appliance made in accordance with the invention and worn on the upper rib cage, thigh and forearm;

Figs. 6 to 10 illustrate front and rear views collectively, of similar appliances worn on the upper body and shoulder regions;

Figs. 11 and 12 are front and cross-sectional views respectively of an appliance made in accordance with another embodiment;

and Figs. 13 to 15 illustrate the construction on appliances made in accordance with a further embodiment.

Referring now to the drawings, an appliance made in accordance with the invention for wearing upon the lower leg

comprises an inner elasticated sock 10 made from stretch neoprene rather like an elasticated joint protector but which covers the entire lower leg from just below the knee down to around the ankle. The sock 10 is shaped to the natural contour of the leg, hugging the structure of the muscles and the tendons and providing a non-slip base around which the rest of the protective device is created. The material of the sock 10 affords an excellent grip which helps it stay in position whilst at the same time enabling completely free movement of the lower leg.

As will be seen from Figs. 1a to 1c the sock 10 is preferably constructed from a number of panels 11 shaped to embrace the sides of the calf region and around and over the ankle bones. The panels are stitched together with elasticated strips 12 and the sock is perforated with air holes 13 to enable the skin to "breathe". For enhanced comfort, the sock may be lined internally with a nylon layer, and a stirrup support 14 may be provided which passes under the foot to prevent the sock from riding up on to the knee.

Referring now to Figs. 2a to 2c, over the sock 10 there are stitched a number of panels 15 of high density synthetic foamed material which is impact absorbent and consists of specially shaped templates to protect designated areas of the leg without inhibiting movement. In particular, the calf muscle, shin bone, Achilles tendon and ankle bones are protected by this layer. Once again air holes 16 may be provided for ventilation. The foam panels are peripherally stitched to the inner sock. If required, a double layer of foam may

be provided along the front of the appliance to give extra absorption in the area of the shin bone.

Referring now to Figs. 3a to 3c and Fig. 4, an outer protective layer is provided in the form of "stretch armour" and consists of a number of panels 17 each comprising a vertical column of overlapping rigid plates 18 of a high density polyethylene connected together by an inner central strip of elastic 19 for each panel 17.

Each such panel 17 of stretch armour and elastic strip 19, is stitched at its opposed ends, as shown at 21, to the inner sock 10.

The plates 18 of each panel, although overlapping and to some extent nesting together, are of progressively varying shape and dimensions throughout the length of the panel thus to conform to the shape of the limb. Thus, for example, the front panel 17 has plates which are wider at the top and gradually reduce in width down towards the ankle. The panels 17 overlap where appropriate to provide a complete shield around the lower leg leaving a space only where necessary to ensure complete freedom of movement.

Because the plates 18 of each panel 17 are interconnected in this way on the strip of elastic 19 which is connected only at upper and lower ends to the inner sock 10 and because they are able to slide relative to one another almost no inhibition of movement is created thereby whilst a highly protective impact shield is provided.



Owing to the overlapping configuration of the plates 18, the force of any impact is distributed throughout the associated panel 17 and thus dispersed over a large surface area with the effect of minimising localised bruising.

The ankle bones are protected also by a small panel 20 of interconnected rigid plates all stitched to the inner sock 10.

The inner sleeve 11 may be of continuous tubular form throughout its length, or alternatively, a plurality of longitudinally-spaced straps to be applied about the body to secure the rigid plates 18.

The entire appliance, because of its close conformity with the shape of the leg may be worn conveniently beneath, for example, a football sock and thus can be concealed thereby. Alternatively, the appliance may be produced with an aesthetically pleasing appearance and in a number of colours as required to depict, for example, a particular sports club or the like. The device is lightweight, flexible and highly protective combining impact absorption, distribution and muscle support.

Whilst the above description and the drawings relate to such an appliance for the lower leg, conceivably a similar appliance may be adapted for use on any part of the body but particularly those parts most prone to impact injury.

Thus, as can be seen in Fig. 5, similar devices may be tailored to be applied to the hip, forearm and rib cage of, for example, a cricket player. In this example each device comprises a base panel 30 and overlapping plates 31 maintained by elasticated straps 32.

Figs. 6 to 10 illustrate similar devices tailored for protection of the rib cage and shoulder regions of the upper body. A yoke-like panel 33 has overlapping plates 34 and 35 to protect the shoulders, chest and back regions, while a bolero-like panel 36 has rows of overlapping plates 37 for protection of the rib cage and mid-to-lower back.

The devices illustrated in Figs. 5 to 10 can be constructed in a manner similar to those illustrated in Figs. 1 to 4.

Referring now to Figs. 11 and 12, in an alternative embodiment, a series of individual plates 38 are similarly maintained in overlapping relationship by an elastic strip 39. However, in this case, each plate 38 comprises a thin back plate portion 40 and a thicker frontal portion 41. As can be seen in Fig. 11, such plates are "nested" together such that the thin portion 40 of each plate sits behind the thicker portion 41 of the next upper plate 38, thus forming a closely interlocked series with maximised impact protection and flexibility. Also by this stepped configuration impact distribution along the device is ensured by direct contact between the aligned thicker portions 41.

Referring now to Figs. 13 to 15, an increased level of protection may be afforded within the overall concept by providing panels of overlapping plates 48, some or all of which may be individually attached to an under-sleeve or panel 49 or to a garment. Each plate 48 has its own individual back panel 50 of a dense foamed plastics absorption material preferably bonded to the rear face of the respective plate 48. In this regard Fig. 13 shows the rear of a single plate and Fig. 14 shows the rear of a series of such plates "nested" together, while Fig. 15 shows how the plates 48 may be individually stitched to the flexible panel 49.

## CLAIMS

1. An appliance for protection against impact and strain injury including a flexible web or sleeve adapted to be worn about a part of the body and to conform closely to the shape thereof, and a plurality of interconnected rigid plates attached to or adapted to be attached to the web or sleeve such as to permit limited relative movement between the plates.
2. An appliance according to Claim 1, wherein the web or sleeve is of continuous tubular form throughout its length.
3. An appliance according to Claim 1, wherein the web or sleeve comprises a plurality of straps to be applied about the body to secure the rigid plates.
4. An appliance according to Claim 1, wherein the flexible web or sleeve comprises a panel being part of an item of sports clothing.
5. An appliance according to Claim 1 or Claim 2, wherein the web or sleeve comprises an elasticated sock adapted to be worn about the lower leg and having outer interconnected rigid plates attached to the sock substantially throughout the length thereof.
6. An appliance according to Claim 5, including, between the sock and the rigid plates, a layer of impact absorbent foamed

material.

7. An appliance according to any preceding claim, wherein the rigid plates are assembled in overlapping relationship connected together via an elastic strip.

8. An appliance according to Claim 7, wherein the rigid plates are of a high density polyethylene and are individually shaped to match the contours of the part of the body about which the appliance is to be worn.

9. An appliance according to Claim 7, wherein the overlapping plates are provided in several vertical columns to be worn about the front and rear regions of the lower leg, each column of plates being connected together by an inner central strip of elastic stitched at its upper and lower ends to the flexible web or sleeve.

10. An appliance according to any preceding claim, wherein each rigid plate comprises a thin back plate portion and a thicker frontal portion, the plates being nested together such that the thin portion of each plate is superimposed behind the thicker portion of the next upper plate thus forming a closely interlocked series of plates in a stepped configuration.

11. An appliance according to any one of Claims 1 to 6, wherein the rigid plates are individually stitched directly to the flexible web or sleeve.

12. An appliance according to any preceding claim, wherein each rigid plate includes an individual back panel of an absorption material bonded or stitched to the rear face of the plate.



Application No: GB 9812600.6  
Claims searched: 1-12

Examiner: Alex Littlejohn  
Date of search: 8 July 1998

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.P): A3V

Int CI (Ed.6): A41D; A63B; F41H

Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB2171893A (Woods) see whole document, e.g. Figs 3-5	1,4,11
X	GB1281882 (Doughty) see whole document, e.g. Fig 4 and page 5 lines 69-83	1,2,4,5,11
X	EP0254751A1 (Descente) see whole document, e.g. col 3 lines 13-47	1,2,4
X	WO94/24893A1 (Le Sueur) see whole document, e.g. Figs 7,8	1,10
X	WO94/14347A1 (West) see whole document, e.g. page 13 line 5 - page 14 line 26	1,4
X	US5634211 (Chen) see whole document, e.g. col 2 lines 41-50	1,3,4
X	US5623729 (Chen) see whole document, e.g. col 2 lines 35-52	1,3,4
X	SU1181619 A (Makeeva) 30.09.85 and also WPI Abstract Accession No. 86-105511[16] see abstract and drawings	1,11

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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